CLAIMS

We claim:

1. A method of predicting a change in an economy, where the economy comprises a plurality of decision makers and economic variables having initial values, said method comprising the steps of:

   a) representing the decision makers by a plurality of agents, where each agent comprises internal state and decision rules defining the agent's actions responsive to input messages and the internal state;

   b) initializing the internal state of each agent;

   c) processing each agent, where processing an agent comprises the steps of:

      i) receiving an input message destined for the agent, if one exists;

      ii) generating output messages and changes to the agent's internal state based on the input message, the agent's internal state, and the agent's decision rules, where an output message comprises information identifying an indicated destination agent;

      iii) repeating steps i) and ii) until there are no more input messages destined for the agent;

   d) routing output messages from each agent to indicated destination agents;

   e) determining new values for the economic variables from the agents' internal states and the output messages;

   f) repeating steps c, d, and e until a terminal condition is reached; and

   g) outputting a representation of the change in the economy based on the initial values of the economic variables and the new values of the economic variables

2. The method of Claim 1, practiced on a computer comprising a plurality of processors, additionally comprising the step of assigning each processor a subset of the agents, where each processor processes the agents assigned thereto.

3. The method of Claim 1, additionally comprising the step of modifying the agent's decision rules during the processing of the agent.

4.   The method of Claim 3, wherein the step of modifying the agent's decision rules during the processing thereof comprises the steps of:

a)   generating a probability vector comprising probabilities the agent will choose among a plurality of selected actions;

b)   causing the agent to take a certain selected action based on the probability vector;

c)   determining if the economic results following the certain action were favorable or unfavorable; and

d)   adjusting the probabilities in the probability vector to increase the probability that the agent will take actions that have been followed by favorable economic results and to decrease the probability that the agent will take actions that have been followed by unfavorable economic results.

5.   The method of Claim 2, wherein the computer additionally comprises an interprocessor communication facility, and wherein the step of routing output messages comprises, on each processor, the steps of:

a)   collecting the output messages from all the agents assigned to the processor;

b)   separating the collected output messages into a first group comprising output messages destined for agents assigned to the processor and a second group comprising output messages destined for agents not assigned to the processor;

c)   routing output messages from the first group without using the interprocessor communication facility; and

d)   routing output messages from the second group using the interprocessor communication facility.

6.   The method of Claim 3, wherein the plurality of decision makers comprises a plurality of household decision makers, wherein each agent representing a household decision maker has internal state representing a saved funds balance, and where each agent representing a household decision maker has decision rules for determining whether to buy product from another agent and whether to borrow funds from another agent.
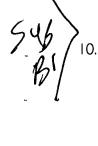
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7. The method of Claim 3, wherein the plurality of decision makers comprises a plurality of industry decision makers, wherein each agent representing an industry decision maker has internal state representing a number of employees working at the agent and an amount of capital assets of the agent, and where each agent representing an industry decision maker has decision rules for determining whether change the number of employees working at the agent, whether to borrow funds from another agent, and what price to charge for the agent's product.

8. The method of Claim 3, wherein the plurality of decision makers further comprises a bank decision maker, and wherein each agent representing a bank decision maker can make loans to other agents and can accept deposits from other agents, and has decision rules for determining a first interest rate to charge on loans and a second interest rate to pay on deposits.

9. A method of using a computer to predict a change in an economy, where the economy has a plurality of variable conditions and a plurality of decision makers, comprising the steps of:

a) representing the plurality of decision makers by a plurality of agents, where each agent comprises internal state and decision rules;

b) establishing initial values for at least one of the variable conditions;

c) for each agent, updating the agent's internal state based on the agent's current internal state, the agent's decision rules, and the values of the variable conditions;

d) for each agent, determining the agent's effect on the variable conditions based on the agent's internal state, the agent's decision rules, and the values of the variable conditions;

e) determining new values for the variable conditions based on a combination of the effects of the plurality agents;

f) repeating steps c through e until a terminal condition is reached; and

g) outputting a representation of the change in the economy from the initial values of the variable conditions and the new values for the variable conditions.
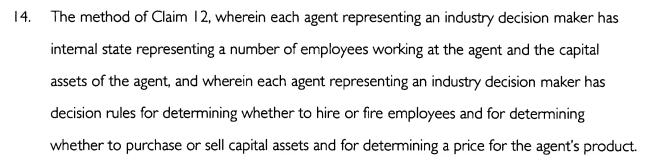
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10. A method of using a multiprocessor computer to predict a change in an economy, where the economy has a plurality of decision makers, comprising the steps of:

    a) representing the plurality of decision makers by a plurality of agents, where each agent has internal state and decision rules and can accept input messages from other agents and generate output messages for other agents;

    b) assigning each agent to at least one processor in the multiprocessor computer;

    c) establishing initial values for at least part of each agent's internal state;

    d) establishing initial input messages for each agent;

    e) on each processing element, determining new values for the internal state of each agent assigned to the processing element and new output messages from each agent assigned to the processing element based on the agent's internal state, input messages for the agent, and the agent's decision rules;

    f) on each processing element, communicating output messages to corresponding agents;

    g) repeating steps e and f until a terminal condition is reached; and

    h) outputting a representation of the change in the economy based on the agents' internal states and the output messages.

11. The method of Claim 7, further comprising the step of modifying at least one agent's decision rules as the agent is processed.

12. The method of Claim 7, wherein the plurality of decision makers comprises a plurality of household decision makers, a plurality of industry decision makers, and a government decision maker.

13. The method of Claim 12, wherein each agent representing a household decision maker has internal state representing a saved funds balance, and wherein each agent representing a household decision maker has decision rules for determining whether to purchase product from an agent representing an industry decision maker and which agent representing an industry maker to purchase product from.

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14.   The method of Claim 12, wherein each agent representing an industry decision maker has internal state representing a number of employees working at the agent and the capital assets of the agent, and wherein each agent representing an industry decision maker has decision rules for determining whether to hire or fire employees and for determining whether to purchase or sell capital assets and for determining a price for the agent's product.

15.   The method of Claim 12, wherein the plurality of decision makers comprises a bank decision maker, and wherein each agent representing a bank decision maker can make loans to other agents and can accept deposits from other agents, and has decision rules for determining a first interest rate to charge on loans and a second interest rate to pay on deposits.